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ABSTRACT

Pedagogy embodies the beliefs one holds about students, about the various attributes of media technologies, and about the essential qualities of the content at hand. Teachers make decisions based on the interactions of these beliefs. Therefore, it is imperative to begin the process of designing and contemplating instruction with a consideration of the beliefs one holds concerning the components of this instruction. This paper presents observations about the pedagogical implications for teaching and learning gathered from the authors' experiences with the development of two types of distributed learning systems--the North Carolina Information Highway (NCIH) and CaseNET. NCIH is a video-based information delivery system developed by a consortium of state agencies and private industry; a lack of consideration of pedagogical issues has hindered utilization of the system for educational purposes. CaseNET is a set of World Wide Web-based courses jointly organized and offered by institutions of higher education and district professional development teams from the United States, Canada, and Norway. In contrast to NCIH, the developers of CaseNET have gone to great lengths to construct a distributed learning environment that allows for support and encourages cooperation, communication, case-writing, and reflective practice. Contains 12 references. (Author/DLS)

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Distributed Learning Environments: Pedagogy, Implementation, and the Early Adopter

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Abstract: Pedagogy embodies the beliefs one holds about students, about the various attributes of media technologies, and about the essential qualities of the content at hand. Teachers make decisions based on the interactions of these beliefs. Therefore, it is imperative that one begins the process of designing and contemplating instruction with a consideration of the beliefs one holds concerning the components of this instruction. This paper offers some observations about the pedagogical implications for teaching and learning gathered from our experiences with the development of two types of distributed learning systems: the North Carolina Information Highway, a video-based system and CaseNET, a World Wide Web-based system.

The widespread interest in network-based learning – partially spurred by the 1993 introduction of the World-Wide Web – has instigated an examination of the underlying structures and assumptions in K-12 and higher education concerning what constitutes sound instruction, and the role that distributed learning environments play in such educational endeavors. What is emerging from such interests is a recognition that traditional teaching practices are often at odds with those to which the new media lend themselves. The result is often a state of cognitive dissonance in which the teachers and students struggle to bring old knowledge to bear on new situations. In a recently released report entitled *Technology and the New Professional Teacher: Preparing for the 21st Century Classroom*, the National Council for Accreditation of Teacher Education [NCATE 1997] offered the following:

> Teachers may be forgiven if they cling to old models of teaching that have served them well in the past. All of their formal instruction and role models were driven by traditional teaching practices. Breaking away from traditional approaches to instruction means taking risks and venturing into the unknown. But this is precisely what is needed at the present time. (Pg. 5)

The "old models" and "traditional approaches" mentioned in this study are deeply rooted in the beliefs teachers hold about teaching and learning, as well as the images they hold of themselves as teachers and their students as learners. These images provide the foundation for the development of certain metaphors which teachers use to guide their practices in instructional environments. What we offer in this paper are some observations about the pedagogical implications for teaching and learning gathered from our experiences with the development of two types of distributed learning systems: the North Carolina Information Highway, a video-based system and CaseNET, a World Wide Web-based system.

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The North Carolina Information Highway[1]

The North Carolina Information Highway (NCIH) is a video-based information delivery system developed by a consortium of state agencies and private industry. Widely regarded as one of the most well-developed information systems in the United States, the NCIH is a fiber-based network that utilizes the latest telecommunications technology – including ATM and SONET – to create a statewide network for information transfer. The following vision is offered from the NCIH website:

> The implementation of the network will result in the construction of an information highway … analogous to the building of the interstate highway system in the 1950s and 60s. Just as the structure of interconnecting multi-laned highways has provided a faster and more efficient way to move products and people, the high-speed network will carry information to all points of the state reliably and economically. This information includes … interactive video-based education classes for sharing the best teachers to improve the quality of instruction and to offer advanced courses … to all of the state's students, statewide access to books, periodicals and technical journals contained in our leading research libraries, and vivid, detailed results of complex engineering and biological/medical calculations performed by our supercomputer for universities and advanced research centers.

Indeed, the NCIH is a technically advanced and sophisticated system. North Carolina now boasts a digital infrastructure that is unparalleled, and supports the potential for commerce, education and communication between individuals at all ends of the state.

However, a lack of consideration for pedagogical issues and an ill-conceived vision for its use in learning environments have hindered utilization of the system for educational purposes. For example, the cost for utilization is prohibitive. The implementation model employed by the developers requires sites to secure funding to participate. Although the state Office of the Controller provided grants to qualified applicants for one-time expenses, no clear vision for sustained funding has ever been advanced. One consequence of this is that sites that have secured funding are almost compulsive about using the system, even if it does not address a clearly articulated need. Another consequence is that the statewide system reaches many fewer locations than projected.

In addition, data is not part of the standard NCIH package – though it is an option. This may, initially, be viewed as a possible oversight; in fact, it is not. The NCIH is, by design, a video-based network. This fact makes explicit some implicit beliefs which decision-makers and developers hold about the nature of the delivery of effective "interactive" education, since video sites rarely have the computing capacity requisite for a combined video- and computer-based learning environment. The composite result of such conditions is that many school systems have been effectively left behind because resources went toward building a system they could not afford and that the system that has been built is used more to justify its use than with good pedagogical practice in mind.

What is evident to us, concerning the dilemma presented by the NCIH, is that decision-makers associated with the design and implementation of the system are clearly operating under some assumptions about teaching and learning that are not conducive to the effective utilization of the environment *for teaching and learning*. The most obvious fallacy lies in the assumption that teaching via the NCIH is really the same as teaching in a classroom. When the traditional approaches fail to elicit the expected responses, many are unable to make the appropriate adjustments required to make it work. While Newton's law – that every action has an equal and opposite reaction – does not quite fit here a version, modified for human terms, which reads that every action has unintended consequences fits very well. What we see is a large number of unintended consequences that are not always recognized as artifacts of applying traditional pedagogical practices to new communications environments. What has been noticeably lacking is any systematic way of looking at the various telecommunications tools and analyzing them in terms of what they can and cannot do within a learning environment.

Alan Kay [Kay 1992] of Apple Computers suggests that people often view new technology in terms of solving old problems before learning that the new technology may make the old problems irrelevant and bring with it new problems or issues. His primary example is the motion picture camera. It existed for 50 years, used primarily as a novelty and as a way to bring a stage play to audiences – using a fixed camera in the position of the audience, focused on the actors on a stage. Such was the prevalent model until D.W. Griffith introduced the motion picture as a distinct art form, through use of close ups, wide-angle shots, different camera positions, and cutting from or into action, and so forth.

The same can be said of the computer and of telecommunications technologies and their use in teaching and learning settings. First efforts historically have been to use the technology in the context of existing pedagogies. Yet, if one studies and understands the inherent characteristics of the various technologies -- what the technology can and cannot do – one begins to recognize the need to break down the old models and get to the essence of what we want to accomplish. To achieve this recognition requires an analysis of the various modes of communication and interaction enabled by the technology, itself, that are conducive to supporting the kind of learning and engagement desired.

Some [Perkins 1990; Pea 1990; Salomon 1990] have suggested that distributed environments result in a diffuse sense of cognition – where what is "known" lies in the interaction between individuals and artifacts, such as computers and other technological devices. However, Kozma [Kozma 1991] suggests that:

> Some students will learn a particular task regardless of the delivery device. Others will be able to take advantage of a particular medium's characteristics to help construct knowledge. Many teachers, it may be said, are no different with regard to their instructional methodologies. (Pg. 205)

A focusing question for those interested in implementation would be: what enduring *cognitive and pedagogical effects* are enabled when an individual is engaged in and with such distributed environments? Previous conceptions of teaching and learning are informed or altered by interaction within such environments and, perhaps even more important, such interactions shape and alter the media, as well. In his reaction to Clark [Clark 1983], Kozma [Kozma 1991] offers the following support:

> Medium and method have a more integral relationship; both are part of the design....the medium enables and constrains the method; the method draws on and instantiates the capabilities of the medium. (pg. 205)

CaseNET[2]

CaseNET is a set of WWW-based courses jointly organized and offered by institutions of higher education and district professional development teams from the U.S., Canada and Norway. Participants include both inservice and preservice educators. CaseNET is not "distance education" in the typical sense of the term. Students meet physically at a particular site and given time and are guided by an instructor on-site. Course readings, instructional materials, and opportunities to discuss educational issues are available through Web-based discussions and videoconferencing.

Site instructors use case methods--similar to instructional approaches used in business, law and medicine--to bridge educational theory and real-life practice in schools through "slices-of-life" scenarios that capture situations in real classrooms. Participants attend to standards of learning and assessment, issues of teaching across the content areas, and challenges of using technology to solve problems in schools while applying an educational problem-solving model for making sound judgments in the demanding situations educators so frequently encounter.

CaseNET encourages participants to:

1. cooperate within teams and compare analyses across teams in search of solutions to real-life educational problems,
2. link with people from other sites to concentrate on case issues,
3. write cases for use in school-embedded staff development and/or in their classrooms, and
4. prepare for continued professional development through "reflection."

CaseNET is an attempt to match the inherent characteristics of certain types of communication tools with learning activities deemed useful for teacher development. Instructors are using technology with an understanding of what it is that students need to do to develop as professional educators and also with a clearer conception of what role they, as teachers, play in such an environment. In large part, both student and instructor are actively engaged in sharing, questioning, and directly experiencing the consequences of making teaching decisions. The developers of this environment have gone to great lengths to construct a distributed learning environment that allows for support and encourages the requisite behaviors listed above. Successful CaseNET instructors do not try to match the method to the media but, rather, extract the meaningful components of the media to support their pedagogical decisions.

The Role of Pedagogy and Belief

One's pedagogy embodies the beliefs one holds about students, about the various attributes of media technologies, and about the essential qualities of the content at hand. Teachers make decisions based on the interactions of these beliefs. Therefore, it is imperative that one begins the process of designing and contemplating instruction with a consideration of the beliefs one holds concerning the components of this instruction. William James, the founder of American psychology, suggests that belief must begin with the act of believing as it relates to hypotheses and options.

James introduces *live* and *dead* hypotheses in his essay *The Will to Believe* [James 1897]. Live hypotheses are ones that truly may be possible, for example: "Students learn best through direct lecture." Dead hypotheses are ones that are not believed possible. When competing hypotheses present themselves, belief is engaged, and a decision requiring action and decision between two or more *genuine* options must be made. Though options may be a combination of (1) living or dead, (2) forced or avoidable, and (3) momentous or trivial, a genuine option is one that is *living, forced and momentous.*

Options are *living* when a choice between to live hypotheses is presented, as opposed to a choice between a live and a dead hypothesis. For example, choosing between "Students learn best via lecture" and "Students learn best via student-directed activity" presents a live option, since either may be considered plausible. However, choosing between "Students learn best via lecture" and "All students are incapable of learning anything" is a dead option. An option is *forced* when the option of "doing nothing" does not exist. Choosing between instructional methods is often a forced choice, especially when presented with an unfamiliar teaching setting. Finally, an option is momentous when the opportunity to choose between competing hypotheses presents a situation that is unique, significant and irreversible. Certainly, choosing to teach via a distributed learning system like the NCIH or CaseNET would qualify as unique, significant and – for the duration of that particular period of instruction, at least – irreversible.

Genuine options exist for teachers in all instructional situations. However, when considering instruction via distributed learning systems, the element of clarity is often missing from the decision-making process, due to a lack of understanding of which options, exactly, are the genuine ones and which are not. The implications of these options are often less clear because of an inadequate amount of attention to beliefs and their roles. However, the pedagogical constructs, which result from the choices between perceived genuine options, are still explicit. These constructs are girded by the beliefs and assumptions teachers hold about how students think and how students learn, stemming from what Bruner [Bruner 1996] refers to as a "folk pedagogy."

The similarities between traditional instructional methods and those methods most effective within distributed learning environments that some have implied are not as closely aligned as many wish. Projecting such similarities upon the distributed learning environment suggests a certain amount of continuity and congruence with more familiar environments for teaching and learning, and tends to reinforce some reasonably poor

teaching decisions. The instructional method that appears to offer the closest point of confluence appears to lie within the lecture mode so teachers and students often find themselves slipping comfortably into the roles of didactic teacher and learner which have seemed to serve them so well in more traditional environments.

There appears to be an inverse relationship between the amount of bandwidth available and the degree of creativity exhibited by the teacher and learners working within the distributed learning environment [Riedl 1994]. That is, the people with the largest amount of bandwidth, which often presents an environment that appears to be very much like a regular classroom as in the case of the NCIH videoconferencing environment, seem to be the least creative. Those with virtually no bandwidth – typified by those with simple modem access, only – tend to create very interesting learning scenarios.

There is a kind of "professional dissonance" that the use of narrow bandwidth causes when good teachers encounter it. Their habits and assumptions about teaching and learning are challenged –a bit of the Deweyan "problematic" is introduced – and they have to be more cognizant, more aware, more active in how they address the idiosyncrasies of the learning environment. Those with bandwidth, however, may fall more easily back on older, more comfortable models that fit – more of a "resonance," between new technology and old teaching. This opportunity is often unavailable to those without the bandwidth.

Successful implementation requires an understanding of the characteristic considerations of early adopters and a recognition of how these early adopters perceive the innovation [Rogers 1983]. How effectively the adoption and diffusion of a particular innovation proceeds is directly related to the:

(a) advantageousness of the innovation;
(b) compatibility with existing values, experiences and needs;
(c) level of complexity during use;
(d) testability; and
(e) observability of direct implications of the innovation [Rogers 1986; Wells & Anderson 1997].

Diffusion relies greatly on the ability to capture those characteristics and somehow relate them to those widely held beliefs common throughout the social/institutional culture system. Teachers who are not looking for different ways to do things do not venture into the narrow bandwidth environment at all.

Those who are looking for ways to open new experiences and exposures to their students do explore the technologies looking for ways to open new opportunities and, thus, we find more creativity. The desire to be creative and to do things differently is the impetus that helps these teachers move into more interesting ways to use the technology and to solve the problems that threaten to get in the way of their efforts. In order to successfully sustain creative and effective usage of distributed learning systems, teachers and decision-makers need to be tuned into the pedagogical assumptions which guide their decisions when planning for integration into educational settings.

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[1] The North Carolina Information Highway website is http://www.ncih.net

[2] The CaseNET website is http://casenet.edschool.virginia.edu